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09/823,929	03/31/2001	John T. Orchard	15685P076	7551

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EXAMINER

DO, CHAT C

ART UNIT	PAPER NUMBER
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2124

DATE MAILED: 06/23/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/823,929

Applicant(s)

ORCHARD, JOHN T.

Examiner

Chat C. Do

Art Unit

2124

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 03/31/2001; 05/10/01; 08/08/01; 01/13/03.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 2-41 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-41 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

1. Claim 1 is cancelled.
2. Claims 2-41 are examining.

#### *Specification*

3. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

4. The abstract of the disclosure is objected to because the abstract is shorter than 50 words in length. Correction is required. See MPEP § 608.01(b).

#### *Claim Objections*

5. Claim 6 is objected to because of the following informalities: insert "by" in claim 6 line 2 as "two-bit input terms **by** a half-adder". Appropriate correction is required.

#### *Claim Rejections - 35 USC § 102*

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 2-3, 5-9, 17-18, and 20-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Grisamore (U.S. 6,535,901)

Re claim 2, Grisamore discloses in Figures 1 and 7 an apparatus comprising a plurality of inputs to receive multiple input terms (1<sup>st</sup> current multiplicand 20, 2<sup>nd</sup> current multiplicand 22, and partial product generator 12); a multi-stage series of Boolean function generators (14) coupled with the inputs to implement one or more full-adders, half-adders (col. 2 lines 36-40 and col. 3 lines 55-61), and single registers (col. 1 lines 36-38) to produce intermediate summation results (output of reduction tree module 14) by combining the input terms (partial product terms from generator 12), the series of Boolean function generators to be structured based, at least in part, on one or more attributes of the input terms (col. 2 lines 36-40); and a multi-input adder (18) logically coupled with the series of Boolean function generators (14) to produce a final sum (34) of the input terms by combining the intermediate summation results (output of 14).

Re claim 3, Grisamore further discloses in Figures 1 and 7 the input terms include one or more accumulator bits (26 and 28).

Re claim 5, Grisamore further discloses in Figures 1 and 7 the Boolean function generators have associated registers (col. 1 lines 35-40).

Re claim 6, Grisamore further discloses in Figures 1 and 7 the series of Boolean function generators is structured to receive three-bit input terms by a full-adder (Figure

3), two-bit input terms by a half-adder (Figure 2), and inherent single-bit input terms by a single register.

Re claim 7, Grisamore further discloses in Figures 1 and 7 the multi-input adder comprises an adder with an input for each single register in a final stage of the multiple stages of the series (18 and col.3 lines 60-63).

Re claim 8, Grisamore further discloses in Figures 1 and 7 single registers in the series of Boolean function generators to receive feedback accumulator bits (26 and 28) from the multi-input adder, the accumulator bits resulting from a multiply-accumulate operation (output of 18).

Re claim 9, Grisamore further discloses in Figures 1 and 7 single registers in the series of Boolean function generators to receive feedback accumulator bits from the multi-input adder, the accumulator bits resulting from a multiply-accumulate operation and an accumulator coupled with the multi-input adder to feed the accumulator bits back into the series of Boolean function generator (Figure 1).

Re claim 17, it is a method claim of claim 2. Thus, claim 17 is also rejected under the same rationale in the rejection of rejected claim 2.

Re claim 18, it is a method claim of claim 3. Thus, claim 18 is also rejected under the same rationale in the rejection of rejected claim 3.

Re claim 20, it is a method claim of claim 5. Thus, claim 20 is also rejected under the same rationale in the rejection of rejected claim 5.

Re claim 21, it is a method claim of claim 6. Thus, claim 21 is also rejected under the same rationale in the rejection of rejected claim 6.

Re claim 22, it is a method claim of claim 7. Thus, claim 22 is also rejected under the same rationale in the rejection of rejected claim 7.

Re claim 23, it is a method claim of claim 8. Thus, claim 23 is also rejected under the same rationale in the rejection of rejected claim 8.

Re claim 24, it is a method claim of claim 9. Thus, claim 24 is also rejected under the same rationale in the rejection of rejected claim 9.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 4, 10-12, 19, and 25-27 are rejected under 35 U.S.C. 103(a) as being obvious over Grisamore (U.S. 6,535,901) in view of Chang et al. ("Hardware-efficient implementations for discrete function transforms using LUT-based FPGAs").

Re claim 4, Grisamore does not disclose the Boolean function generator comprise four-input look-up tables (LUTs) to implement Boolean logic functions. However, Chang et al. disclose in Figure 1(a) Boolean function generator comprise four-input look-up tables (LUTs) to implement Boolean logic functions (left column page 310 lines 1-5). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add a LUTs to implement Boolean logic functions as seen

in Chang's invention into Grisamore's invention because it would enable to reduce the hardware cost.

Re claims 10-12, Grisamore does not disclose in Figures 1 and 7 the series of Boolean function generators is incorporated in a dedicated logic device comprising a FPGA wherein the device with control logic and a block of dedicated logic. However, Chang et al. disclose the series of Boolean function generators is incorporated in a dedicated logic device comprising a FPGA wherein the device with control logic and a block of dedicated logic (2<sup>nd</sup> paragraph on the left column page 309). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to implement the Boolean function generators in a dedicated logic device comprising a FPGA with control logic and a block of dedicated logic as seen in Chang et al.'s invention into Grisamore's invention because it would enable an operator to dynamically program his/her own logic functions based on needs and cost (2<sup>nd</sup> paragraph on the left column page 309).

Re claim 19, it is a method claim of claim 4. Thus, claim 19 is also rejected under the same rationale in the rejection of rejected claim 4.

Re claim 25, it is a method claim of claim 10. Thus, claim 25 is also rejected under the same rationale in the rejection of rejected claim 10.

Re claim 26, it is a method claim of claim 11. Thus, claim 26 is also rejected under the same rationale in the rejection of rejected claim 11.

Re claim 27, it is a method claim of claim 12. Thus, claim 27 is also rejected under the same rationale in the rejection of rejected claim 12.

10. Claims 13-16 and 28-31 are rejected under 35 U.S.C. 103(a) as being obvious over Grisamore (U.S. 6,535,901) in view of Chang et al. ("Hardware-efficient implementations for discrete function transforms using LUT-based FPGAs") in view further of Fang et al. ("A hierarchical functional structuring and partitioning approach for multiple-FPGA implementations").

Re claims 13-16, Grisamore in view of Chang disclose in Figures 1 and 7 an FPGA architecture to implement the one or more full-adders (Figure 3), half-adders (Figure 2), and single registers (col. 1 lines 35-40), the architecture based at least in part on an analysis of the input terms (col. 2 lines 35-40) comprising a bit-wise analysis (col. 2 lines 33-35). Grisamore does not disclose in Figures 1 and 7 a controller or a logic control module dynamically structures the atomic elements of the dedicated logic device. However, Fang et al. disclose in Figure 3 a controller or a logic control module dynamically (left column 3<sup>rd</sup> paragraph page 1189 and Module1(DP) in Figure 3) structures the atomic elements of the dedicated logic device (Figure 3). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add a controller or a logic control module dynamically structures the atomic elements of the dedicated logic device as seen in Fang's invention into Grisamore in view of Chang's invention because it would enable an operator to dynamically program or configure a specific function in low manufacturing time and cost.

Re claim 28, it is a method claim of claim 13. Thus, claim 28 is also rejected under the same rationale in the rejection of rejected claim 13.



Re claim 29, it is a method claim of claim 14. Thus, claim 29 is also rejected under the same rationale in the rejection of rejected claim 14.

Re claim 30, it is a method claim of claim 16. Thus, claim 30 is also rejected under the same rationale in the rejection of rejected claim 16.

Re claim 31, it is a method claim of claim 15. Thus, claim 31 is also rejected under the same rationale in the rejection of rejected claim 15.

11. Claims 32 and 36-38 are rejected under 35 U.S.C. 103(a) as being obvious over Grisamore (U.S. 6,535,901) in view of the admitted prior art.

Re claim 32, Grisamore discloses in Figures 1 and 7 a method for performing arithmetic comprising: generating a plurality of partial products from two or more input terms(12); that implements in one or more full-adders, half-adders, and single registers to produce intermediate summation results by combining the partial products (col. 1 lines 35-40 and col. 2 lines 35-40); receiving in both branches accumulator bits over a feedback path (26 and 28); and adding (18) the intermediate summation results with the accumulator bits for each branch to produce a final real-component sum and a final imaginary-component sum. Grisamore does not implicitly disclose two paths one for a real-component branch, inverting certain partial products and passing the inverted and non-inverted partial products and one for an imaginary-component branch, passing the partial products to a multi-stage series of Boolean function generators. However, the admitted prior art clearly discloses in page 2 in the background invention section in the present applicant a complex arithmetic operation comprising two paths (real and

imaginary in eq(1)) one for a real-component branch (first two terms in the left hand side of eq(4)) inverting certain partial products (e.g. inverting b1d1 and b2d2) and passing the inverted and non-inverted partial products (first left hand term in eq(5)) and one for an imaginary-component branch (last two terms in eq(4)), passing the partial products (right hand term in eq(5)). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add two paths one for a real-component branch, inverting certain partial products and passing the inverted and non-inverted partial products and one for an imaginary-component branch, passing the partial products as seen in the background invention section of the present invention into Grisamore's invention because it would enable to reduce the complexity of processing the complex operands and increase the speed of operation.

Re claim 36, Grisamore further discloses in Figures 1 and 7 generating a plurality of partial product terms comprises combining the two or more inputs in a combinatorial stage of a complex multiply accumulator (Figure 1).

Re claim 37, Grisamore further discloses in Figures 1 and 7 analyzing one or more attributes of the input terms (col. 2 lines 35-40).

Re claim 38, it is a method claim of claim 15. Thus, claim 38 is also rejected under the same rationale in the rejection of rejected claim 15.

12. Claims 33-35 are rejected under 35 U.S.C. 103(a) as being obvious over Grisamore (U.S. 6,535,901) in view of the admitted prior art in further view of Chang et al. ("Hardware-efficient implementations for discrete function transforms using LUT-based FPGAs").

Re claim 33, it has same limitations cited claim 10. Thus, claim 33 is also rejected under the same rationale in the rejection of rejected claim 10.

Re claim 34, it has same limitations cited claim 11. Thus, claim 34 is also rejected under the same rationale in the rejection of rejected claim 11.

Re claim 35, it has same limitations cited claim 12. Thus, claim 35 is also rejected under the same rationale in the rejection of rejected claim 12.

13. Claims 39-41 are rejected under 35 U.S.C. 103(a) as being obvious over Grisamore (U.S. 6,535,901) in view of the admitted prior art in further view of Chang et al. ("Hardware-efficient implementations for discrete function transforms using LUT-based FPGAs") and in further view of Fang et al. ("A hierarchical functional structuring and partitioning approach for multiple-FPGA implementations").

Re claim 39, it has same limitations cited claim 13. Thus, claim 39 is also rejected under the same rationale in the rejection of rejected claim 13.

Re claim 40, it has same limitations cited claim 14. Thus, claim 40 is also rejected under the same rationale in the rejection of rejected claim 14.

Re claim 41, it has same limitations cited claim 16. Thus, claim 41 is also rejected under the same rationale in the rejection of rejected claim 16.

### ***Conclusion***

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Art Unit: 2124

- a. Non-Patent Literature to Chu et al. disclose a boolean function generator with learning capability.
- b. Non-Patent Literature to Marek et al. disclose a minization of multiple-valued input multi-output mixed-radix exclusive sums of products for incompletely specified Boolean functions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (703) 305-5655. The examiner can normally be reached on M => F from 7:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaki Kakali can be reached on (703) 305-9662. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do  
Examiner  
Art Unit 2124

June 1, 2004



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